Vis/NIR Level 2 Cloud Retrievals

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Vis/NIR L2 Cloud Retrievals

The UC Santa Barbara team has reported results from their cloud detection algorithm when it is applied to real MODIS data. I will discuss its performance against our simulated data sets which, while less realistic, have the advantage of our knowing the "true" geophysical conditions.

Due to some confusion with our CM system, the May 29 exercise was run with an invalid Vis/NIR L2 cloud retrieval. When retrievals are re-run, global statistics on performance will be available.

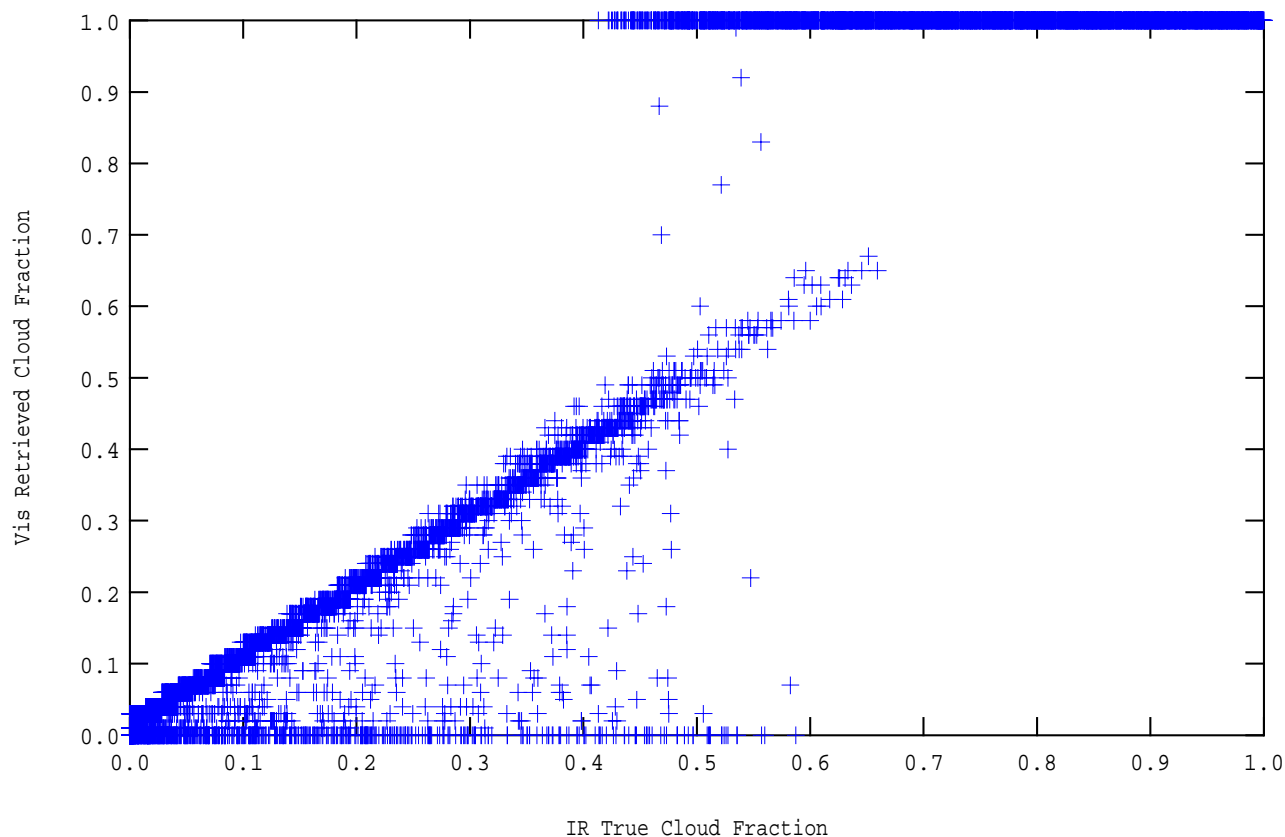For this meeting, ran three granules to get a feel for the performance against our simulated data.
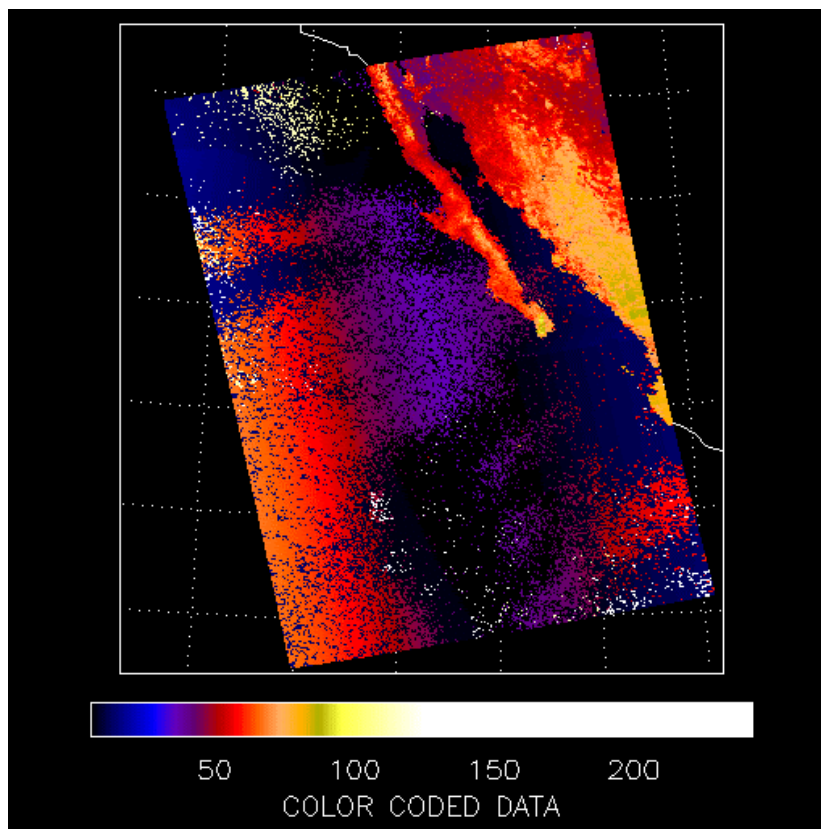
Channel 3 Radiances, Granule 208
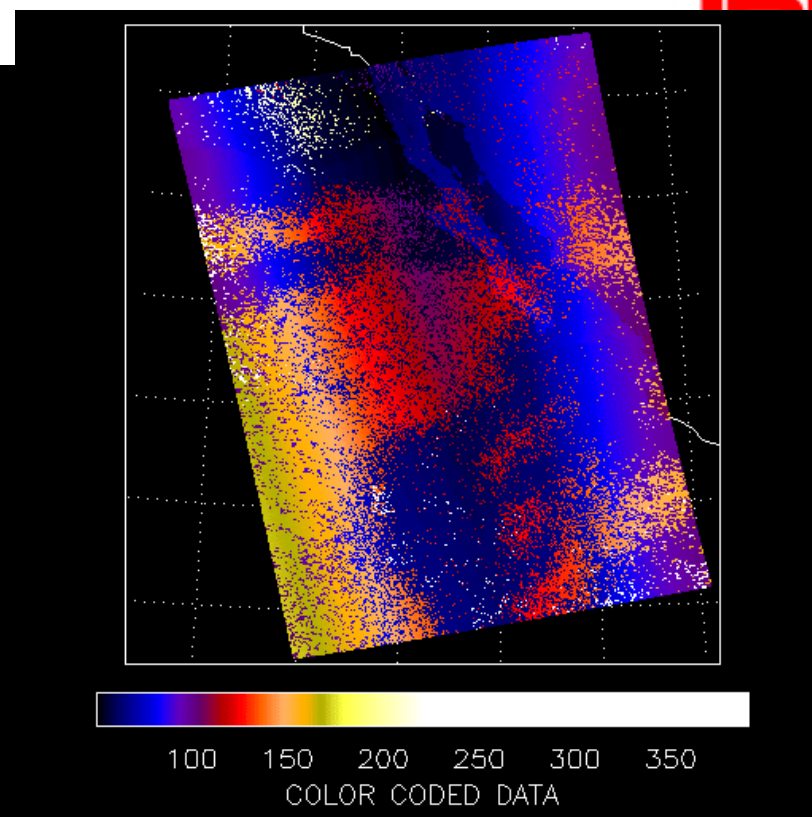
Channel 1 Radiances, Granule 208

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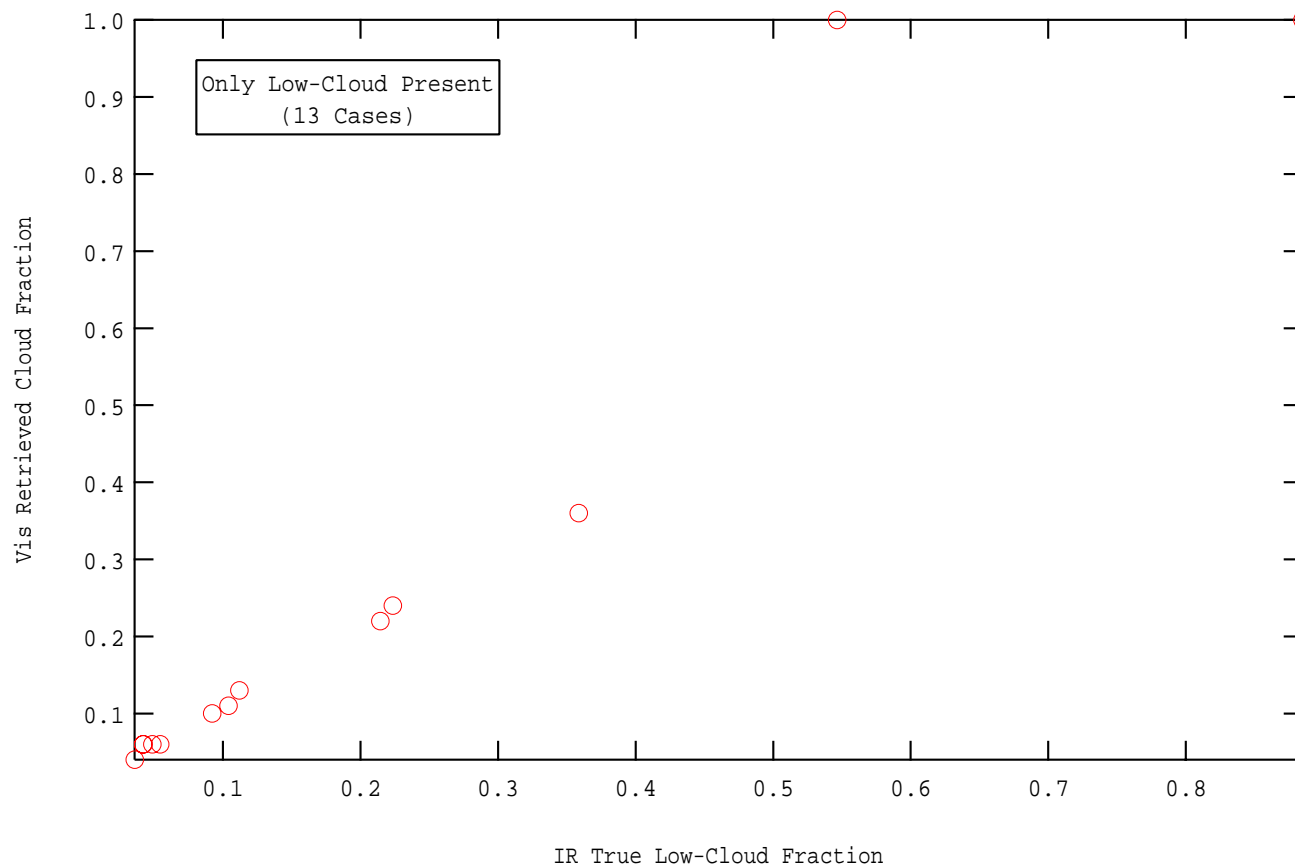GRANULE 208 (Pacific Ocean, Baja, and parts of Mexico) 12150 Points
Total IR True Clear = 3090
Total Vis Retrieved Clear = 2449
Total Vis False Clear = 492 (614 raw)
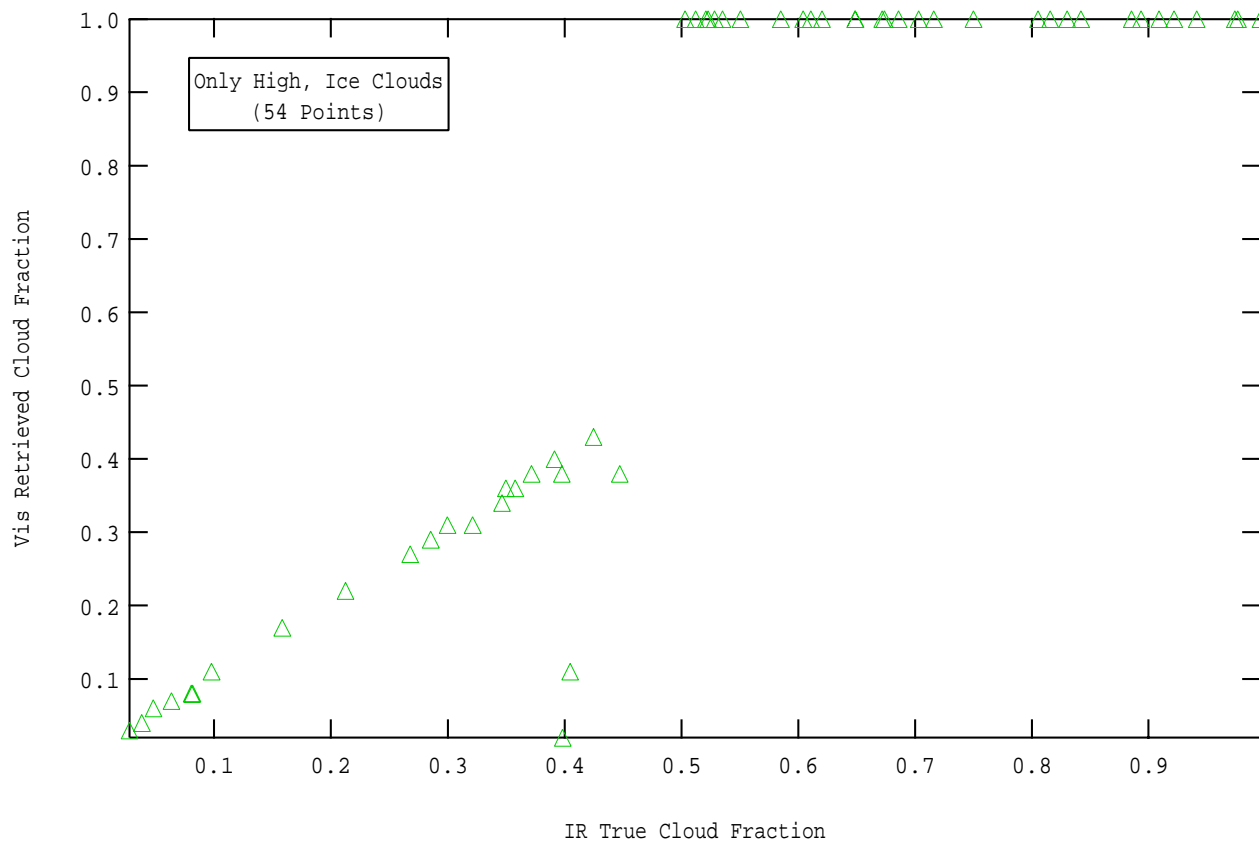Total Vis Missed Clear = 0 (1255 raw)

Vis/NIR L2 Cloud Retrievals
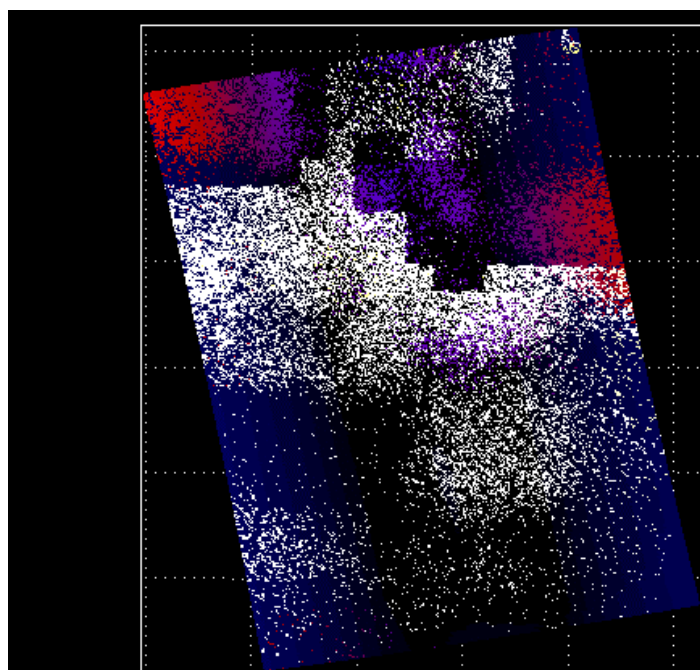
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GRANULE 208 (Pacific Ocean, Baja, and parts of Mexico) 13 Points

Only IR Footprints with one cloud layer, and cloud-top pressure > 500 mbar
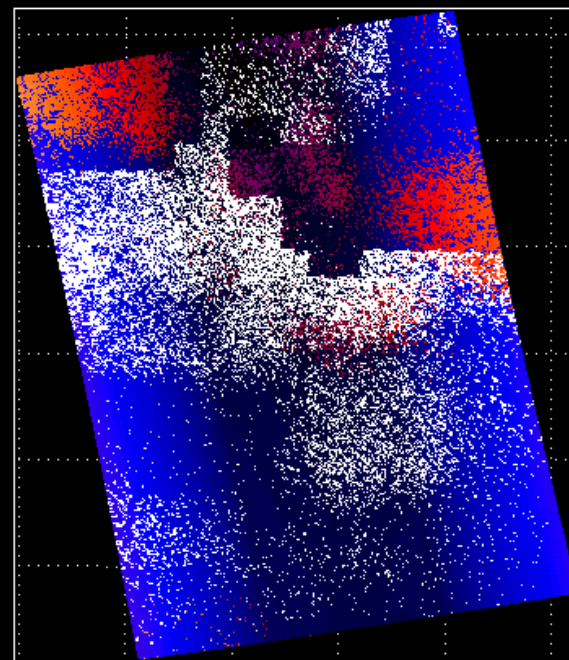
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GRANULE 208 (Pacific Ocean, Baja, and parts of Mexico) 54 Points
Only IR Footprints with one cloud layer, cloud-top pressure < 500 mbar,
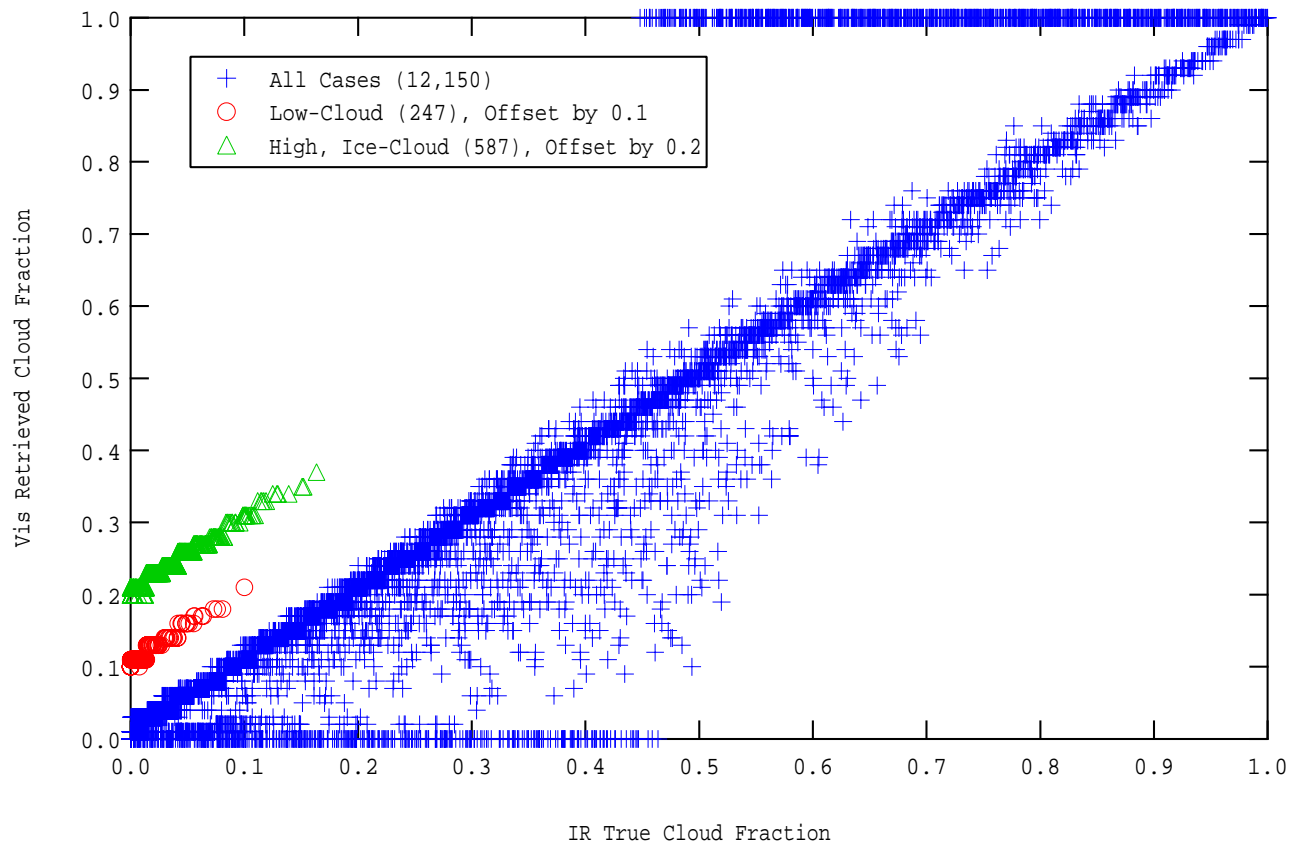and cloud-top temperature < 253 K

Channel 3 Radiances, Granule 207

Channel 1 Radiances, Granule 207

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Legend:
- + All Cases (12,150)
- O Low-Cloud (247), Offset by 0.1
- △ High, Ice-Cloud (587), Offset by 0.2

Y-axis: Vis Retrieved Cloud Fraction
X-axis: IR True Cloud Fraction

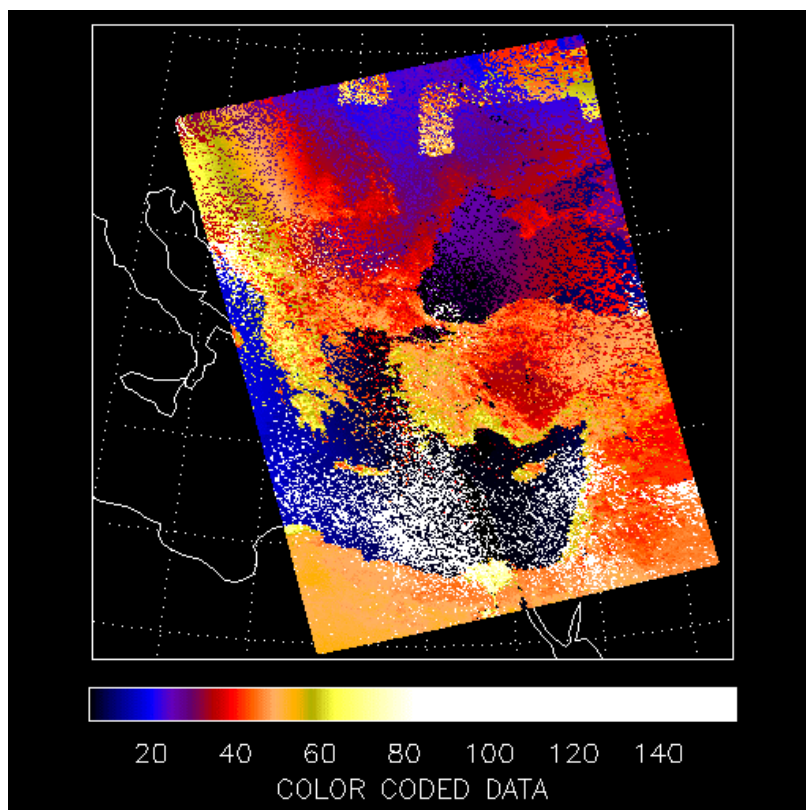GRANULE 207 (Equatorial Pacific Ocean)
Total IR True Clear = 1953
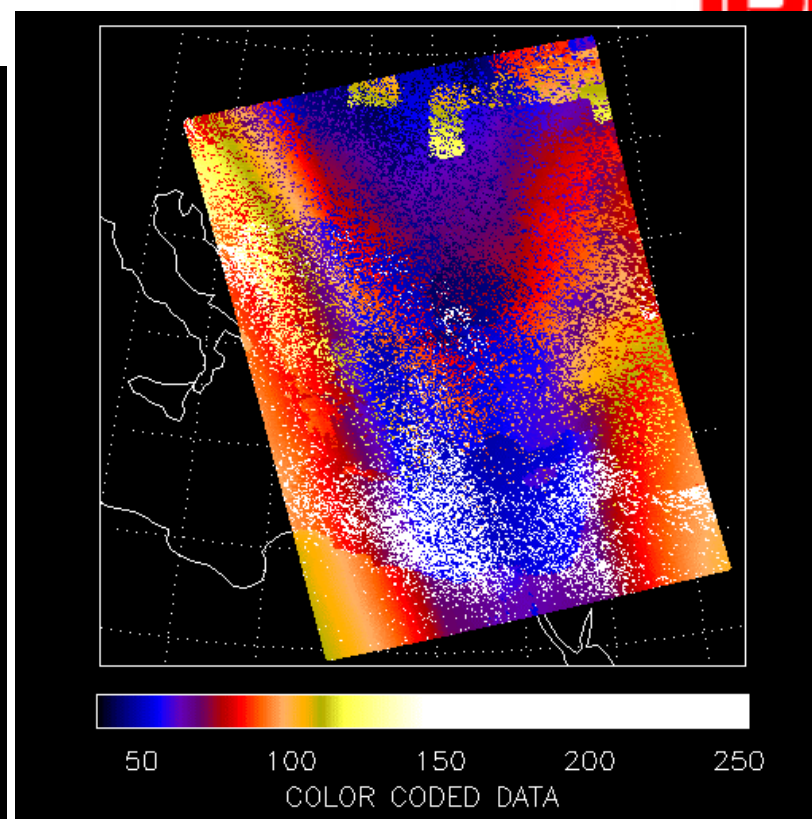Total Vis Retrieved Clear = 1909
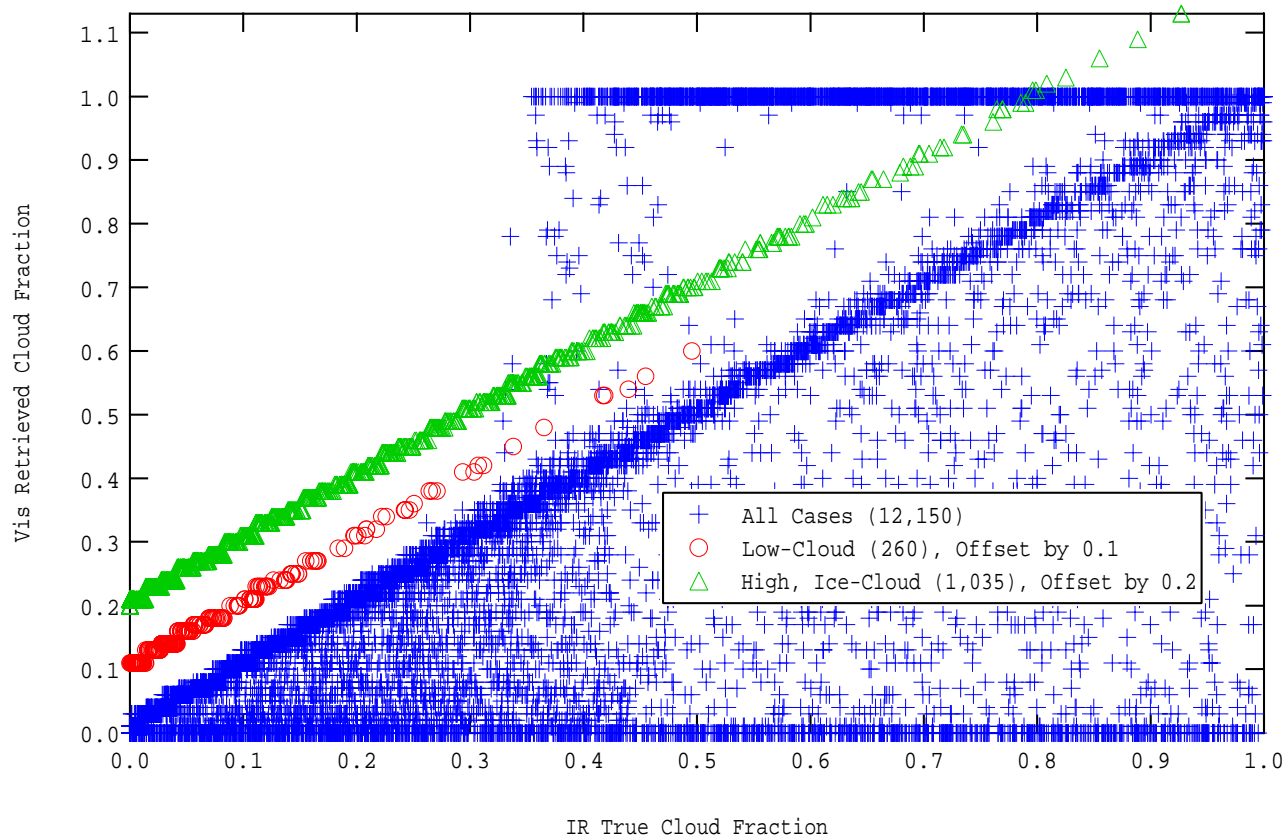Total Vis False Clear = 598
Total Vis Missed Clear = 0

Channel 3 Radiances, Granule 110

Channel 1 Radiances, Granule 110

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GRANULE 110 (Eastern Mediterranean, Eastern Europe)
Total IR True Clear = 462
Total Vis Retrieved Clear = 2311
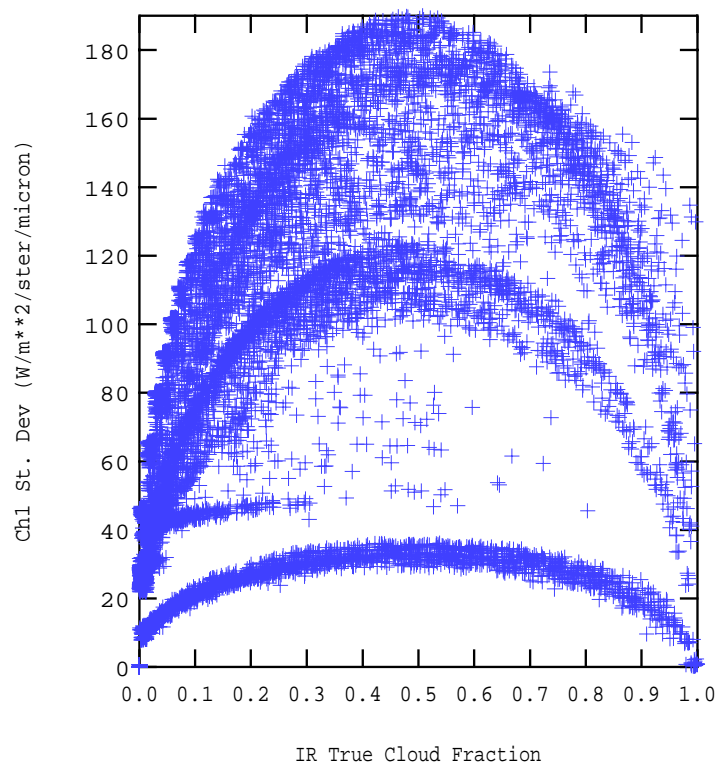Total Vis False Clear = 1929
Total Vis Missed Clear = 0
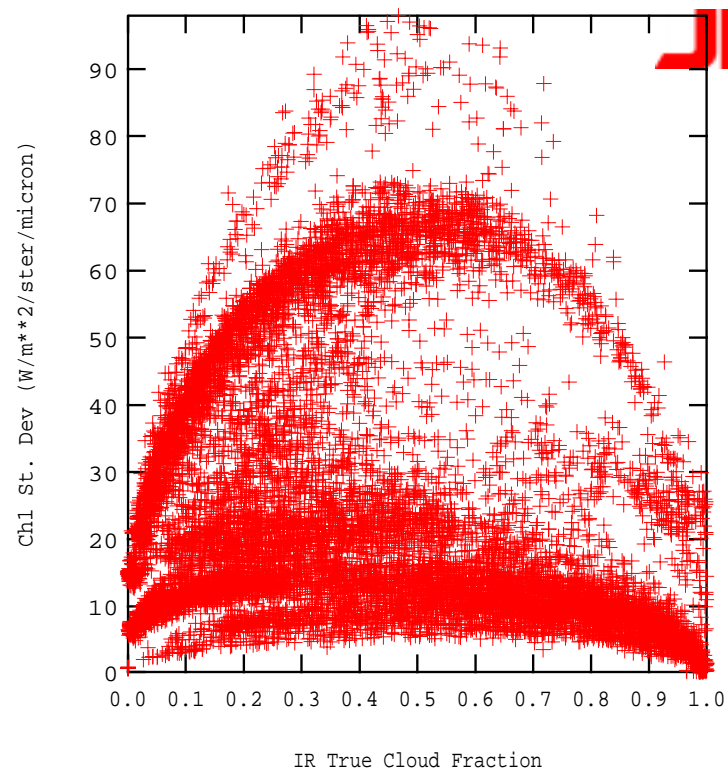
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The variance of Vis/NIR L1B radiances may also be a good indicator of the presence of clouds.   This approach has worked well with AVHRR data.

Stan. Dev. of Ch. 1 Radiance vs. Cloud
Fraction over Ocean (Granule 207)

Stan. Dev. of Ch. 1 Radiance vs. Cloud
Fraction over Land (Granule 110)

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Conclusions

The L2 Vis/NIR cloud detection algorithm appears to be working fairly well. Many false detections result from the algorithm's assumption that high thin cirrus clouds, when present, are likely to appear in many nearby pixels–an assumption not incorporated into the simulated data. Some clouds may be missed due to thresholds being optimized for conditions more realistic than are simulated (sunglint being one example). Software "switches" will be used in future exercises to optimize results when working with simulated data.

In the future, we also intend to explore how effective L1B threshold and variability tests are in detecting clouds as compared to the more sophisticated L2 analysis.